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Two new infraspecific taxa of *Verbascum delphicum* (Scrophulariaceae, Scrophularieae) from mainland Greece and the island of Evvia

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Abstract

Verbascum delphicum Boiss. & Heldr. subsp. *cervi* Zografidis (Scrophulariaceae, Scrophularieae) is described as a subspecies new to science and illustrated. It is narrowly distributed in the Greek National Park of Mt Parnitha (Attica, Greece) with a very small population size. The new subspecies is a seldom-collected taxon, previously overlooked and misidentified as consubspecific with the autonymous subspecies, an endemic of the island of Evvia (Greece). Also described in this study is a new variety of subsp. *delphicum* from Mt Ochi of southern Evvia.

Keywords

Verbascum, new subspecies, endangered taxon, Mt Parnitha

Introduction

Comprising more than 360 species, *Verbascum* L. (Scrophulariaceae) is the largest genus of the predominantly northern temperate tribe Scrophularieae Dumort. (= Verbasceae Dumort.) and is chiefly represented by rosulate, biennial or perennial herbs with yellow-flowered, thyrsic or racemose inflorescences (Fischer 2004; Oxelman et al. 2005). Although the genus is widely distributed in Eurasia and North Africa, species

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diversity is mostly concentrated in a region encompassing Anatolia, Caucasus, northwestern Iran, the Levant and the southern Balkans (Murbeck 1939). In Greece, *Verbascum* is among the 10 most species-rich and the 10 most range-restricted-rich genera with a total of 76 species and an endemism rate of 32% (Dimopoulos et al. 2013).

Verbascum was extensively studied by the Swedish botanist Svante Murbeck who published two monographs on *Verbascum* and *Celsia* L. —now merged in *Verbascum*— and a series of two additional, supplementary and interpretative studies on the genus (Murbeck 1925; 1933; 1936; 1939). Since his era, several other species have been discovered and described, principally but not exclusively from Anatolia (AI-Hemaid 2001; Aytaç and Duman 2012; Bani et al. 2010; Çeçen et al. 2015; Davis 1951; 1952; Firat 2015; Greuter and Rechinger 1972; Huber-Morath 1939; 1949; 1955; 1960; 1965; 1967; 1971; 1973; 1974; 1975; 1976; 1979; 1981; 1983; Karavelioğullari 2015; Karavelioğullari et al. 2011; Karavelioğullari et al. 2004; Karavelioğulları et al. 2009; Karavelioğullari et al. 2008; Karavelioğullari et al. 2014; Kaynak et al. 2006; Parolly and Eren 2008; Parolly and Tan 2007; Ranjbar and Nouri 2015; Sotoodeh et al. 2015; Sotoodeh et al. 2016; Stefanova-Gateva 1979) and a modified classification system of "*informal, partly artificial groups*" has been utilized by Arthur Huber-Morath for the Turkish taxa (Huber-Morath 1978). Both taxonomies of Murbeck and of Huber-Morath are still widely cited and used today in studies of new species; however, it should be noted that a first assessment of molecular data suggests these schemes are non-natural and that the genus has potentially been subjected to taxonomic inflation (Ghahremaninejad et al. 2014).

Verbascum delphicum Boiss. & Heldr. was discovered by Theodor von Heldreich on Mt Dirfi of the island of Evvia (West Aegean Islands, Greece) and was subsequently jointly described by himself and Edmond Boissier in Boissier's Diagnoses plantarum Orientalium novarum (Boissier 1856). The autonymous subspecies is a nemoral, short-lived perennial or biennial herb with often impressive, sizeable basal leaves. Knowing the taxon well from my excursions on the mountains of central and south Evvia I was surprised to find on Mt Parnitha (Attica, Sterea Ellas, mainland Greece) on May 2013 a small population of a closely related, yet distinct and undescribed as it appeared to be taxon. The population consisted of biennial plants with noticeably smaller and more or less differently shaped leaves than those of the insular *V. delphicum*. Inspection of the mainland population in the past recent years and comparison with the insular populations revealed some additional deviating traits for the taxon on Mt Parnitha. Taking into consideration overall morphology and the common habitat and phenology of the two taxa, as well as the phytogeographic connection between Sterea Ellas and Ins. Evvia, I propose that collectively the differences indicate distinction at the subspecies rank.

The new subspecies *V. delphicum* subsp. *cervi* Zografidis described and illustrated in this work was apparently overlooked and misidentified by Murbeck as consubspecific with subsp. *delphicum* based on material collected by Heldreich and Bassilios Tuntas from Mt Parnitha. The differences between the two subspecies are presented and discussed. A new, distinct variety of subsp. *delphicum* from Mt Ochi, south Evvia is also described.

Methods

For the cultivated material current-year seeds were sown in early October (2013 & 2015), in small pots filled with Compo® Bio Anzucht- und Kräutererde substrate. Two-weeks old plants were individually transferred in plastic pots 7 cm of diameter and were transplanted every c. 8 weeks two additional times in successively larger plastic pots, 15 and 24 cm of diameter. The plants were kept outdoors, daily receiving 5 hours of direct sunlight on average, whereas the substrate was kept moist but not soggy.

Measurements were performed either with a common ruler or under a stereo-microscope (Zeiss, Stemi 2000-C) equipped with a camera and ImagePro software. Because the population size of the new subspecies is extremely small the measurements were either performed *in situ* without damaging the plants, or, when this was not feasible, only small plant-parts were collected for subsequent assessment under the stereo-microscope. In particular, two flower-clusters (glomerules) of the middle part of the inflorescence were removed from 20 individual plants i) at flowering and ii) at fruiting. Statistical significance was assessed with two-tailed T-tests for two independent means ($p<0.01$) and two-tailed Mann-Whitney U-tests ($p<0.01$).

Taxonomy

***Verbascum delphicum* Boiss. & Heldr. subsp. *cervi* Zografidis, subsp. nov.**
urn:lsid:ipni.org:names:77158533-1
Figures 1, 2; Suppl. material 1

Diagnosis. subsp. *cervi* can be distinguished from subsp. *dephicum* by a combination of the following characters: lamina of larger rosette-leaves 6–22 × 3–11 cm (vs. 16–40 × 11–24), 1.5–3.7 of length to width ratio (vs. 1.2–1.9), obtuse-cuneate at the base (vs. obtuse-truncate to cordate); indumentum of abaxial surface of rosette-leaves thinner; indumentum of adaxial surface of first-year mature rosette-leaves ± harsh (vs. soft); stamen filaments greenish-white (vs. orange).

Type. GREECE. Attica: Mt Parnitha, 38°09'N, 23°43'E, limestone slope with *Abies cephalonica*, 1100 m, 22 June 2015, *A. Zografidis 109*. (Holotype: ATH, Isotype: ATHU)

Description. Monocarpic, eglandular- and minutely glandular-hairy biennial herb —or rarely short-lived perennial bicarpic— producing a well-branched taproot and a basal leaf-rosette in the first year of vegetative growth, followed by the production of additional rosette-leaves (in the same rosette) and an erect, terete, leafy flowering-stem in the second year of vegetative and reproductive growth. Eglandular hairs dendritic, 0.2–0.8 mm of length, more or less covering the whole aerial part of the plant; glandular hairs minute, sparse, present on leaves, bracts, bracteols and calyx segments, visible by microscopy; fully developed first-season rosettes yellowish- to brownish- and harshly-tomentose above, grayish- or yellowish- to brownish-,

Figure 1. *Verbascum delphicum* subsp. *cervi* Zografidis: **A** habit **B** first year mature leaf-rosette, bar = 10 cm **C** partial inflorescence, bar = 1 cm **D** capsules, bar = 5 mm **D** seeds, bar = 2 mm.

and ± harshly-tomentose beneath; rosette-leaves few to several (up to 50 in cultivated specimens), petiolate; petiole 1–10 cm of length; lamina ovate-elliptic to oblanceolate, 1.5–3.7 of length to width ratio, obtuse-cuneate at the base, crenate, obtuse at apex; larger leaf laminas 6–22 × 3–11 cm; second year mature rosette-leaves and lower cauline-leaves similar but ± glabrescent on adaxial surface; middle cauline-leaves progressively smaller, shortly petiolate, obtuse at the base, obtuse or subacute at the apex; upper cauline-leaves, small, sessile, obtuse at the base, subacute at the apex; all cauline leaves alternate; stem 40–160 cm of height, green to reddish-black, glabrescent but ± persistently tomentose below; Inflorescence 25–60 cm of height, simple or sparingly branched at the base with short, sub-erect branches and then inflorescence narrowly pyramidal in outline; flowers arranged in clusters of pedicellate, compacted cymes (glomerules), ± crowded at least above, consisting of 3 – 12 flowers; bracts 3–7 × 2–4 mm, ovate-lanceolate, acute to acuminate, glabrescent; bracteoles present, similar to

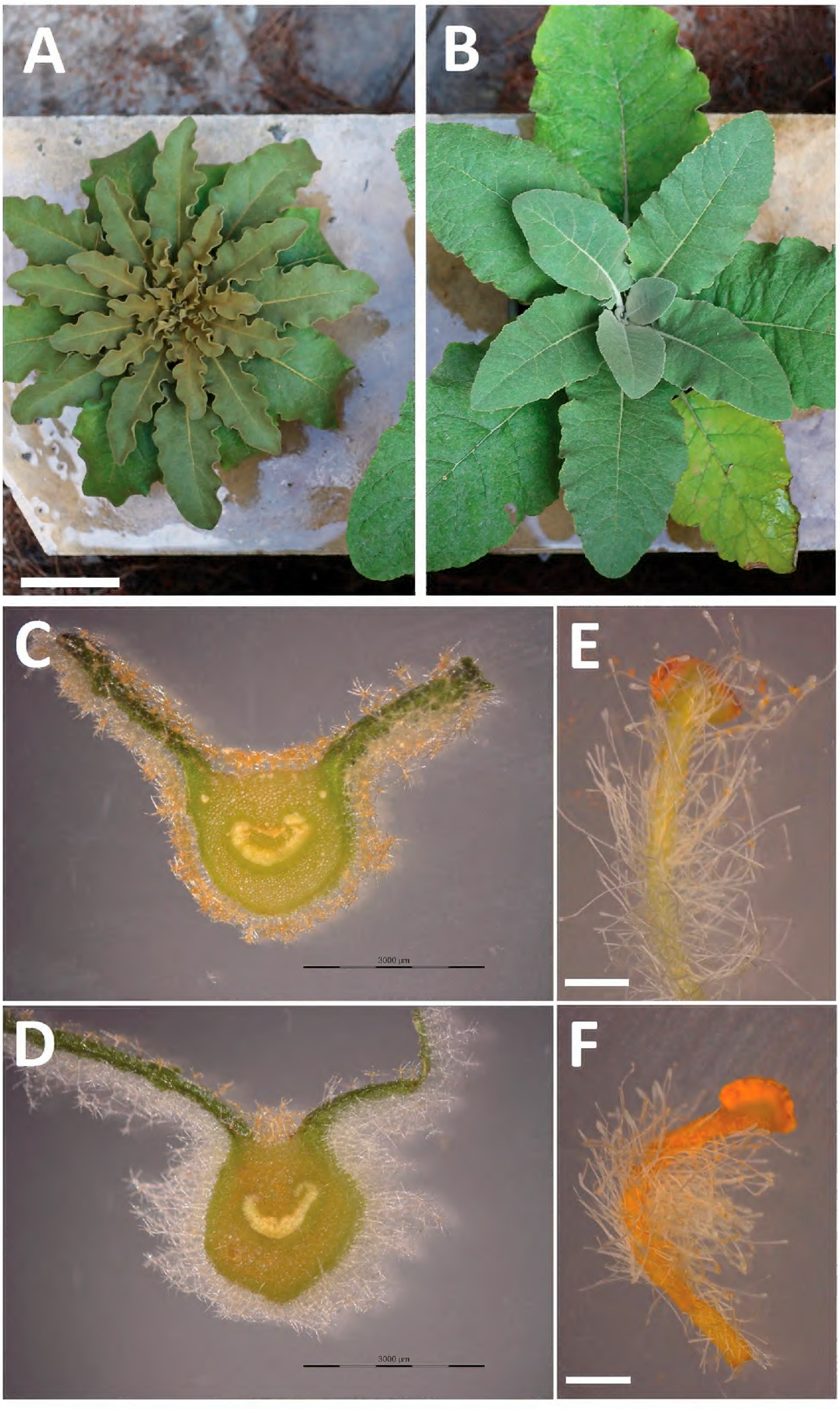

Figure 2. Comparative illustration of *V. delphicum* subsp. *cervi* and subsp. *delphicum* differential traits: **A, C, E** subsp. *cervi* **B, D, F** subsp. *delphicum* **A, B** first-year mature rosette-leaves of cultivated plants, bar = 10 cm **C, D** cross section of leaves indicating the shorter and darker indumentum of subsp. *cervi*, bars = 3 mm **E, F** anterior stamens, bars = 1 mm;

bracts but smaller; longer pedicels 3–8 mm of length, tomentose, ± glabrescent; calyx divided almost to the base into 5 lanceolate to lanceolate-linear, acute segments, 3.5–6 × 1.1–1.7 mm; abaxial surface of calyx tomentose, ± glabrescent; corolla rotate, flat, 1.6–3.6 cm of diameter, light yellow, often with purple marks on the throat, with pellucid glands, divided to c. 3/4 into 5 broadly-obovate, subequal lobes; abaxial surface of corolla partially tomentose, adaxial surface often ciliate near the throat, otherwise glabrous; tube of corolla ± infundibuliform, 1–2.7 mm of length, 1.5–2.9 mm of diameter; stamens 5, free, densely ciliate with white, clavate hairs which reach the connective of anthers; three posterior stamens 5–9.5 mm, two anterior stamens 7–12 mm; stamen filaments greenish-white, occasionally with a purple tinge; all five anthers reniform, mediofix, papillose on adaxial surface, 0.6–1.5 mm; style tomentose at the base, 6–10 mm, clavate at the apex; stigma hemispherical; capsule (excl. rostrum) 3.5–7.5 × 3–5.4 mm, ovoid to broadly ovoid, densely tomentose on early development, later glabrescent, with a rostrum 1–1.5 mm; seeds numerous, chestnut brown to dark brown, 0.7–1 × 0.5–0.7 mm, obpyramidal to ovoid-oblong, irregularly prismatic, faveolate with 3–7 pits in each longitudinal series.

Etymology. Name derives from the genitive of the Latin word "cervus" in reference to the red deer of the National Park which were often observed in the subspecies habitat. The popular animals are a considerable threat to their own *Verbascum* as they consume the young inflorescences.

Verbascum delphicum Boiss. & Heldr. subsp. *delphicum* var. *filictorum* Zografidis, var. nov.

urn:lsid:ipni.org:names:77158534-1
Figure 3; Supplementary file 2.

Diagnosis. Variety *filictorum* differs from typical subsp. *delphicum* in that it produces sterile stems up to c. 80 cm of height instead of basal leaf-rosettes.

Type. GREECE. Ins. Evia. Above the settlement of Ag. Dimitrios, 38°06'N, 24°26'E, in patches of *Pteridium aquilinum*, 500 m, 4 July 2015, *A. Zografidis* 113. (Holotype: ATH, Isotype: ATHU)

Description. Polycarpic eglandular- and minutely glandular-hairy short-lived perennial herb —or less often monocarpic biennial— producing a well-branched taproot and a sterile, erect or ascending, terete, leafy stem in the first year of vegetative growth, followed by the production of an additional sterile stem and a terete flowering-stem in each of the succeeding few years of vegetative and reproductive growth. Eglandular hairs dendritic, 0.4–2 mm of length, more or less covering the whole aerial part of the plant; glandular hairs minute, sparse, present on leaves, bracts, bracteols and calyx segments, visible by microscopy; fully developed first-season leaves whitish- to yellowish- and softly-tomentose above, grayish-white and softly tomentose beneath; sterile stems up to 80 cm in height; fertile stems 40–180 cm of height, green to reddish-black, glabrescent but ± persistently, tomentose below; lower cauline-leaves petiolate;

Figure 3. *Verbascum delphicum* subsp. *delphicum* var. *filictorum* Zografidis: Habit. A sterile stem is discernible next to the flowering stem.

petiole up to 15 cm of length; lamina ovate to widely ovate, 1.2–1.9 of length to width ratio, obtuse-truncate to cordate at the base, crenate, obtuse at apex; larger leaf laminas 16–40 × 11–24 cm; middle cauline-leaves similar but progressively smaller and often subacute at the apex, shortly petiolate; upper cauline-leaves small, sessile,

ovate-cordate, subacute at the apex; all cauline leaves alternate; Inflorescence 25–60 cm of height, simple or sparingly branched at the base with short, sub-erect branches and then inflorescence narrowly pyramidal in outline; flowers arranged in clusters of pedicellate, compacted cymes (glomerules), ± crowded at least above, consisting of 3 – 12 flowers; bracts 3–7 × 2–4 mm, ovate to lanceolate, acute to acuminate or cuspidate, glabrescent; bracteoles present, similar to bracts but smaller; longer pedicels 4–10 mm of length, tomentose, ± glabrescent; calyx divided almost to the base into 5 lanceolate to lanceolate-linear, acute segments, 3.5–6 × 1.1–1.7 mm; abaxial surface of calyx tomentose, ± glabrescent; corolla rotate, flat, 1.5–2.8 cm of diameter, yellow, with or without indistinct purple marks on the throat, with pellucid glands, divided to c. 3/4 into 5 broadly-obovate, subequal lobes; abaxial surface of corolla partially tomentose, adaxial surface sometimes ciliate near the throat, otherwise glabrous; tube of corolla ± infundibuliform, 1–2.3 mm of length, 1.5–2.2 mm of diameter; stamens 5, free, ciliate with white, clavate hairs which reach the connective of all anthers or do not reach the connective of the anterior stamens; three posterior stamens 5–8 mm, two anterior stamens 6–10 mm; stamen filaments orange; all five anthers reniform, mediofix, papillose on adaxial surface, or glabrous on adaxial surface of the connective of anterior stamens, 0.8–1.4 mm; style tomentose at the base, 6–9 mm, slightly clavate at the apex; stigma hemispherical; capsule (excl. rostrum) 3.5–7 × 3–5 mm, ovoid to broadly ovoid, densely tomentose on early development, later glabrescent, with a rostrum 1–1.5 mm; seeds numerous, chestnut brown to dark brown, 0.7–1.1 × 0.5–0.7 mm, obpyramidal to ovoid-oblong, irregularly prismatic, faveolate with 4–8 pits in each longitudinal series.

Etymology. Name is in reference to the often abounding in ferns habitat of the variety.

***V. delphicum* specimens examined.** subsp. *cervi*: GREECE. Attica: In regione abietina montis Parnethis, 5–18 June 1911, Tuntas s.n. (GB)

subsp. *delphicum*: GREECE. Ins. Evvia: In rupidus ad cacumen m. Delphi, 5000', 19 August 1948, Heldreich, 2040 (G-BOISS); In regione sylvatica & superiore montis Dirphyis (Delphi hod.) usque ad cacumen, 3000'-5500' 31 July–5 August 1858, Heldreich 799 (K, P); Insula Evvia meridionalis, Montes Ocha, in valle infra Hagios Dimitrios, ca. 600 m, 21 May 1955, K. H. Rechinger, 17181 (W); Insula Evvia meridionalis, Montes Ocha, in querceto-castanetis vers us Kallianou, ca. 600 m, 22 May 1955, K. H. Rechinger, 17220 (W); Insula Evvia meridionalis, 3 km a promontorio Kaphireos occidentem versus, 22 June 1958, K. H. Rechinger, 18953 (W).

Results and discussion

The differences between *V. delphicum* subsp. *cervi* and subsp. *delphicum* are presented in Table 1, whereas a comparative illustration is presented in Figure 2. A three-year field survey of both insular and mainland populations and examination of cultivated plants confirmed the constancy of the distinctive features. Subspecies *cervi* is characterized by

Table 1. Diagnostic characteristics of *V. delphicum* subsp. *cervi* and subsp. *delphicum*. Numbers in brackets indicate mean and standard deviation values.

	V. delphicum* subsp. *cervi	***V. delphicum* subsp. *delphicum***
Life cycle	Monocarpic biennial, rarely polycarpic short-lived perennial	Polycarpic short-lived perennial or monocarpic biennial
Indumentum of first year mature rosettes on adaxial surface of leaves	Yellowish to brownish, harsh	Grayish-white to yellowish, soft
Indumentum of rosette leaves on abaxial surface	Grayish-white or yellowish to brownish, thin	Grayish-white, thick
Dendritic hairs (mm)	0.2–0.8	0.4–2
Length to width ratio of leaf-lamina (rosette leaves)	1.5–3.7 [2.5 ± 0.5]	1.2–1.9 [1.6 ± 0.2]
Lamina of larger leaves, (cm)	6–22 [14.7 ± 4.4] × 3–11 [6.2 ± 1.9]	16–40 [26.6 ± 7.1] ×11–24 [17 ± 3.5]
Base of lamina	Obtuse-cuneate	Obtuse-truncate to cordate
Stamen filaments	Greenish-white	Orange
Hairs on connective of anterior stamens (adaxial surface)	Present	Frequently absent

its smaller and more elongated leaves with the base of leaf-laminas obtuse to long-cuneate —vs. ± truncate or even cordate in subsp. *delphicum*— and by a shorter, harsher and darker indumentum. Another significant character is the color of the stamen filaments: either greenish-white in subsp. *cervi* or deep-orange in subsp. *delphicum*. I note that this character is almost lost with drying. Life-cycle is an additional interesting trait. In his Flora Orientalis, Boissier has cited *V. delphicum* as a biennial herb (Boissier 1856), a vague conception which has been perpetuated in various floras ever since (Ferguson 1972; Raus 1986). Although biennial individuals are indeed found among its populations, the autonymous subspecies is more frequently a short-lived perennial herb as evidenced by the concomitant existence of the flowering stem and either of an additional leaf-rosette or of a previous-year withered infructenscence or of both on the same plants. On the other hand, subsp. *cervi* has clearly drifted towards the biennial life-cycle and very rarely do the plants exceed the usual two years lifespan —I have seen only two such individuals.

On Mt Parnitha and on the mountainous region of central Evvia —Mts Dirfi and Xirovouni— *V. delphicum* inhabits Greek-fir or mixed *Abies-Castanea* woodlands, flowers from early-mid-June to early-mid-August and matures seeds from July to August. On Mt Ochi of southern Evvia the species is found in open *Castanea* woodlands —*Abies* is absent from southern Evvia— or in sub-montate to montane, open shrublands dominated by thick patches of *Pteridium aquilinum* ferns. In these habitats of Mt Ochi, I have found that subsp. *delphicum* frequently produce sterile stems instead of basal leaf rosettes; the unusual trait gives a quite distinctive appearance to the plants but apart from it they are indistinguishable from typical individuals that grow in proximity. I propose this taxon to be classified as a new variety of subsp. *delphicum* (Figure 3 and Supplementary file 2). The variety might have evolved from the competition for sunlight inside the dense patches of ferns of these habitats, whereas I have never found

it in central Evvia —not even in the shadier spots where subsp. *delphicum* produces the typical basal rosettes.

Murbeck's assumption that typical *V. delphicum* existed on Mt Parnitha was based on the following material he cited in his monograph: i) a collection by Heldreich —"*Parnes, reg. abiet. occid., leg. HELDREICH 1854, n. 2902 [Hb. Berl.]*"— even though Heldreich himself never reported *V. delphicum* from mainland Greece and the date of the collection, which has unfortunately been destroyed during World War II (Th. Raus, personal communication, 27 August 2015), precedes by two years that of the original description of the species; ii) three collections by collector Bassilios Tuntas —"*Parnes, reg. abiet., occid., leg. TUNTAS 5/7/1911, n. 1247 [Hb. Hal.; Hayek].- Mt Parnes, prope cacumen, leg. TUNTAS 21/7/1907, n. 356 [Hb. Hal.]; 13/6/1909, n. 810 [Hb. Hal.]*"— which, however, were not found either in WU-Generale, WU-Halácsy-Graecum or WU-Halácsy-Europaeum (W. Till, personal communication, 15 March 2016). Perhaps the only surviving voucher is kept in the Gothenburg Herbarium and likely corresponds to the aforementioned n. 1247 specimen of the collector, although the serial number is missing. Nevertheless, on the sheet there is a label with Murbeck's name and handwriting that states "*V. delphicum*". Having seen the specimen I have no doubt it represents subsp. *cervi* on account of the characteristic small basal leaves with an obtuse-cuneate base and the short indumentum. It is interesting to note that the aforementioned specimen includes the whole aerial part of a plant arranged on a single sheet, which is actually feasible for a medium individual of subsp. *cervi* —e.g., see the Holotype, Supplementary file 1. On the contrary, a medium individual of subsp. *delphicum* is impossible to completely fit on a voucher sheet because the basal leaves are too big. I conclude that on Mt Parnitha there exists a single infraspecific taxon of *V. delphicum*, namely subsp. *cervi*, allopatric to the insular subsp. *delphicum* which is confined to Evvia. The species had not been collected from the mainland for almost a century, but its existence was confirmed by a recent floristic study on the mountain (Aplada et al. 2007), (E. Aplada, personal communication 1 September 2016). Other reports of *V. delphicum* from the mainland —from the Peloponnese cited in (Dimopoulos et al. 2013) or from Mt Pendeli cited in (Vladimirov et al. 2012)– are in error (Th. Raus, and K. Polymenakos, personal communications respectively). The distribution map of *V. delphicum* is presented in Figure 4.

Suggested conservational status

V. delphicum subsp. *cervi* is restricted to the core of the National Park of Mt Parnitha where it apparently constitutes a single, fragmented population within an area of occupancy of less than 1 km^2 and a total population size of no more than 50 mature individuals (August 2016). The alarmingly rare new taxon has suffered habitat loss with the devastating fire of 2007 on the mountain and is now under direct threat by the overpopulated deer of the National Park which consume the developing inflorescences; the bitten plants respond by producing a few new small flowering shoots but seed yield is expected to be

Figure 4. Distribution map of *Verbascum delphicum*: ■ subsp. *cervi*; ●, ○ subsp. *delphicum*; ○ var. *filictorum*.

severely affected. Importantly, the population size of *V. delphicum* subsp. *cervi* has been reduced about 20% over the last three years and the taxon is apparently critically endangered according to IUCN Red list criteria C(2a(i,ii)) and D(1) (IUCN 2001).

Comments on taxonomic affinities and phytogeography

Considering the recent radiation in the genus *Verbascum* (Ghahremaninejad et al. 2014) and the strong phytogeographic connection between Ins. Evvia and Sterea Ellas (Trigas 2003), it is reasonable to assume that *V. delphicum* subsp. *cervi* represents a neoendemic taxon that has diverged from the insular subspecies through the process of allopatric subspeciation. On the other hand, the infrageneric relationships of *V. delphicum* are more difficult to infer. In particular, Murbeck places *V. delphicum* under Sect. *Bothrosperma* Murb., Subsect. *Fasciculata* Murb., B. *Isandra* Franch., p. p., a.

Bracteolata Murb., α *Umbellulifera* Murb., 1. *Adenanthera* Murb. and further groups it with the widespread in the Balkans *V. banaticum* Schrad. on account of the white stamen-hairs and the relatively long pedicels. However, the two species are very different and only doubtfully closely related —*V. banaticum* is an eglandular herb with lobed and pinnatisect at the base of the lamina rosette-leaves, freely branched, leafy, lax inflorescences and has smaller all flower parts and capsule. Rather I suspect that *Adenanthera* —i.e. having papillate connective of the anthers of the anterior stamens— is a non-monophyletic trait and that *V. delphicum* is actually more closely related to some *Leianthera* Murb. —i.e. with glabrous connective— species of the centered but not restricted to the Balkans group of *V. nigrum* L., *V. chaixii* Vill., *V. lanatum* Schrad. and *V. glabratrum* Friv. These species show considerable resemblance to *V. delphicum* with respect to general leaf morphology, indumentum and habit. Moreover, additionally to their glabrous connective of anterior stamens, these species all differ from *V. delphicum* in the purple stamen-hairs and in the more or less striate stems. I should also note at this point that the connective of the anterior stamens of *V. delphicum* is often glabrous too and this is particularly evident for subsp. *delphicum* — Figure 2F shows one such stamen with the hairs not found on the connective. Intriguingly, *V. delphicum* also shows considerable phenetic resemblance with two Asiatic species, namely *V. discolor* Murb. from the Amanus Mountains and *V. antitauricum* Hub.-Mor. from the Anti-Taurus mountains, both of south-central Turkey. *V. discolor* is generally a more glabrous plant than *V. delphicum* with glabrous connective of anterior stamens, glabrous outer surface of the corolla and a more branched and laxer inflorescence. *V. antitauricum*, similarly to *V. delphicum* has either papillate or glabrous connective of anterior stamens but has bicolored stamen-hairs, glabrous corollas on the outer surface, more or less shorter pedicels and it is eglandular. In any case, the differences between *V. delphicum* and the Turkish species are not more pronounced than those between *V. delphicum* and the aforementioned Balkan species —compared individually— and thus additional data from molecular phylogenetics and/or cytological studies are needed for clarifying the topic of *V. delphicum* infrageneric affinities.

Conclusions

Both infraspecific taxa of *V. delphicum* described in this study are distinct and easily recognized, whereas the species closest relative remains unknown. Subspecies *cervi* is apparently a critically endangered taxon.

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References

Al-Hemaid FMA (2001) Notes on *Verbascum* L., from Saudi Arabia with description of eight new species. Pakistan Journal of Botany 33(4): 315–328.

Aplada E, Georgiadis Th, Tiniakou A, Theocharopoulos M (2007) Phytogeography and ecological evaluation of the flora and vegetation of Mt Parnitha (Attica, Greece). Edinburgh Journal of Botany 64(2): 185–207. doi: 10.1017/S096042860700087X

Aytaç Z, Duman H (2012) *Verbascum hasbenlii* (Scrophulariaceae), a new species from Turkey. Turkish Journal of Botany 36: 322–327. doi: 10.3906/bot-1108-9

Bani B, Adigüzel N, Karavelioğullari FA (2010) *Verbascum turcicum* (Scrophulariaceae), a new species from Turkey. Annales Botanici Fennici 47: 489–492. doi: 10.5735/085.047.0608

Boissier E (1856) *Verbascum delphicum* Boiss. & Heldr. Diagnoses plantarum Orientalium novarum ser 2 no 3. Apud B. Herrmann, Lipsiae. http://bibdigital.rjb.csic.es/ing/Libro.php?Libro=1417&Pagina=148

Çeçen Ö, Karavelioğulları FA, Ünal A (2015) *Verbascum misirdalianum* (Scrophulariaceae), a new species from central Anatolia, Turkey. Phytotaxa 217(1): 96–99. doi: 10.11646/phytotaxa.217.1.10

Davis PH (1951) Three New Species from the Nearer East. Notes from the Royal Botanic Garden Edinburgh 21(1): 46–52.

Davis PH (1952) Additamenta ad Flora Anatoliae: III. Notes from the Royal Botanic Garden Edinburgh 21(2): 61–98.

Dimopoulos P, Raus Th, Bergmeier E, Constantinidis Th, Iatrou G, Kokkini S, Strid A, Tzanoudakis D (2013) Vascular plants of Greece: An annotated checklist. Botanischer Garten und Botanisches Museum Berlin-Dahlem, Berlin; Hellenic Botanical Society, Athens.

Ferguson IK (1972) *Verbascum* L. In: Tutin TG, Heywood VH, Burges NA, Moore DM, Valentine DH, Walters SM, Webb DA (Eds) Flora Europaea Vol 3. Cambridge University Press, 205–216.

Firat M (2015) *Verbascum kurdistanicum* (Scrophulariaceae), a new species from Hakkâri, Turkey. PhytoKeys 52: 89–94. doi: 10.3897/phytokeys.52.5188

Fischer E (2004) Scrophulariaceae. In: Kubitzki K, Kadereit J (Eds) Flowering Plants – Dicotyledons: Lamiales The Families and Genera of Vascular Plants VII. Springer, 333–432. doi: 10.1007/978-3-642-18617-2_21

Ghahremaninejad F, Riahi M, Babaei M, Attar F, Beh¸cet L, Sonboli A (2014) Monophyly of *Verbascum* (Scrophularieae : Scrophulariaceae): evidence from nuclear and plastid phylogenetic analyses. Australian Journal of Botany 62: 638–646. doi: 10.1071/BT14159

Greuter W, Rechinger KH (1972) *Verbascum spathulisepalum* (Scrophulariaceae) eine neue Art aus Nordost-Griechenland. Botaniska Notiser 125: 494–497.

Huber-Morath A (1939) Über orientalische *Verbascum*- und *Celsia*-Arten. Feddes repertorium specierum novarum regni vegetabilis 46: 169–184.

Huber-Morath A (1949) Studien über anatolische *Verbascum* und *Celsia* arten Candollea 12: 187–218.

Huber-Morath A (1955) Verbreitung der Gattungen *Verbascum*, *Celsia* und *Straurophragma* im Orient. BAUHINIA 1(1): 1–83.

Huber-Morath A (1960) Novitiae Florae Anatolicae V. Gattung *Verbascum* L. BAUHINIA 1(3): 335–349.

Huber-Morath A (1965) Bearbeitung orientalischer Verbasceen, 1961-1964. BAUHINIA 2(3): 239–259.

Huber-Morath A (1967) Novitiae Florae Anatolicae VIII. BAUHINIA 3(2): 311–326.

Huber-Morath A (1971) Die türkischen Verbasceen. Denkschriften der Schweizerischen Naturforschenden Gesellschaft 87: 1–166.

Huber-Morath A (1973) *Verbascum* L. s.l. (incl. *Celsia* L. et *Staurophragma* Fisch. & Mey.). BAUHINIA 5(1): 7–16.

Huber-Morath A (1974) Novitiae Florae Anatolicae X. BAUHINIA 5(2): 101–102.

Huber-Morath A (1975) Zwei neue *Verbascum*-Arten aus Iran. BAUHINIA 5(3): 147–149.

Huber-Morath A (1976) Novitiae Florae Anatolicae XI. BAUHINIA 5(4): 231–232.

Huber-Morath A (1978) *Verbascum* L. In: Davis P (Ed) Flora of Turkey and the East Aegean Islands Vol 6. Edinburgh University Press, Edinburgh, 461–603.

Huber-Morath A (1979) Novitiae Florae Anatolicae XIII. BAUHINIA 6(3): 369–374.

Huber-Morath A (1981) Novitiae Florae Anatolicae XIV. BAUHINIA 7(2): 77–80.

Huber-Morath A (1983) Novitiae Florae Anatolicae XVI. BAUHINIA 7(4): 269–271.

IUCN (2001) IUCN Red List Categories and Criteria: Version 3.1: IUCN Species Survival Commission. IUCN, Gland, Switzerland & Cambridge, UK.

Karavelioğullari FA (2015) New species and new hybrid of genus *Verbascum* L. (*Verbascum mecit-vuralii* Karavel. *Verbascum* x *ersin-yücelii* Karavel.) from Turkey. Biological Diversity and Conservation 8: 78–82.

Karavelioğullari FA, Çelik S, Başer B, Yavru A (2011) *Verbascum ergin-hamzaoglui* (Scrophulariaceae), a new species from South Anatolia, Turkey. Turkish Journal of Botany 35: 275–283. doi: 10.3906/bot-1003-51

Karavelioğullari FA, Duran A, Hamzaoğlu E (2004) *Verbascum tuna-ekimii* (Scrophulariaceae), a new species from Turkey. Annales Botanici Fennici 41: 227–231.

Karavelioğulları FA, Ocak A, Ekici M, Cabi E (2009) *Verbascum eskisehirensis* sp. nov. (Scrophulariaceae) from central Anatolia, Turkey. Nordic Journal of Botany 27(3): 222–227. doi: 10.1111/j.1756-1051.2008.00250.x

Karavelioğullari FA, Uzunhisarcikli ME, Çelik S (2008) *Verbascum ozturkii* (Scrophulariaceae) a new species form East Anatolia, Turkey. Pakistan Journal of Botany 40(4): 1595–1599.

Karavelioğullari FA, Yüce E, Başer B (2014) *Verbascum duzgunbabadagensis* (Scrophulariaceae), a new species from eastern Anatolia, Turkey. Phytotaxa 181(1): 47–53. doi: 10.11646/phytotaxa.181.1.3

Kaynak G, Daşkin R, Yilmaz Ö, Erdoğan E (2006) *Verbascum yurtkuranianum* (Scrophulariaceae), a new species from northwest Anatolia, Turkey. Annales Botanici Fennici 43: 456–459.

Murbeck S (1925) Monographie der Gattung *Celsia* Lunds Universitets årsskrift. n. f., avd. 2.

Murbeck S (1933) Monographie der Gattung *Verbascum*. Lunds Universitets årsskrift. n. f., avd. 2.

Murbeck S (1936) Nachträge zur Monographie der Gattung *Verbascum*. Lunds Universitets årsskrift. n. f., avd. 2.

Murbeck S (1939) Weitere Studien über die Gattungen *Verbascum* und *Celsia*. Lunds Universitets årsskrift. n. f., avd. 2.

Oxelman B, Kornhall P, Olmstead RG, Bremer B (2005) Further disintegration of Scrophulariaceae. Taxon 54(2): 411–425. doi: 10.2307/25065369

Parolly G, Eren Ö (2008) *Verbascum haraldi-adnani* (Scrophulariaceae), a new chasmophytic species from SW Anatolia, Turkey. Willdenowia 38: 127–134. doi: 10.3372/wi.38.38107

Parolly G, Tan K (2007) *Verbascum lindae* (Scrophulariaceae), a new species from SW Anatolia, Turkey. Willdenowia 37: 277–282. doi: 10.3372/wi.37.37116

Ranjbar M, Nouri S (2015) *Verbascum albidiflorum* (Scrophulariaceae), a new species from W Iran Willdenowia 45: 147–155. doi: 10.3372/wi.45.45115

Raus Th (1986) *Verbascum* L. . In: Strid A, Tan K (Eds) Mountain Flora of Greece Vol 2. Edinburgh University Press, 170–188.

Sotoodeh A, Attar F, Civeyrel L (2015) *Verbascum shahsavarensis* (Scrophulariaceae), a new species for Flora of Iran. Phytotaxa 203(1): 76–80. doi: 10.11646/phytotaxa.203.1.8

Sotoodeh A, Attar F, Civeyrel L (2016) A new species of *Verbascum* L. (Scrophulariaceae) from the Gilan province (Iran), based on morphological and molecular evidences. Adansonia 38(1): 127–132. doi: 10.5252/a2016n1a9

Stefanova-Gateva B (1979) Zwei neue Arten der Gattung *Verbascum* in Bulgarien. Feddes Repertorium 90(7–8): 407–408. doi: 10.1002/fedr.19790900704

Trigas P (2003) Contribution to the study of the endemism of the flora of the island of Evvia (W Aegean, Greece). PhD Thesis, University of Patras, Patras.

Vladimirov V, Dane F, Tan K (2012) New floristic records in the Balkans: 20. Phytologia Balcanica 18(3): 333–373.

Supplementary material 1

***Verbascum delphicum* subsp. *cervi* Zografidis subsp. nov., holotype.**
Authors: Aris Zografidis
Data type: JPEG file
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Supplementary material 2

***Verbascum delphicum* subsp. *delphicum* var. *filictorum* Zografidis var. nov., holotype.**
Authors: Aris Zografidis
Data type: JPEG file
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